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ABSTRACT

The purpose of this paper is to identify patterns of performance which might yield insight into findings concerning mathematics achievement of Chicano students. The Chicano student populations of these studies were identified and restricted by the following criteria: Spanish surname, of Mexican descent, language (bilingual, Spanish-English; monolingual, Spanish), geographic area (southwestern and western United States). The majority of Chicano students in the studies were from backgrounds of low socioeconomic status. This paper summarizes the general results of the literature reviewed and concludes with an annotated bibliography. The review of the studies is organized according to three major constructs: (1) Tests, (2) Instructional Programs, and (3) Socio-Cultural-Economic Conditions. Section 1 contains three subsections: (a) Mental Ability Profiles, (b) Language and Cultural Factors in Tests, and (c) Reliability and Predictability of Mental Ability and Achievement Tests. Section 2 contains three subsections: (a) Bilingual Programs, (b) Teacher-Student Interactions, and (c) Special Programs. The studies are cross-referenced under appropriate subsection; thus the results of one study may be included under more than one topic. (Author/SD)

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SMESG Working Paper No. 10

Test Factors, Instructional Programs, and Socio-Cultural-Economic Factors Related to Mathematics Achievement of Chicano Students: A Review of the Literature

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Introduction

The increasing interest in Chicano students and education in the last few years has compelled many educators to search for answers to questions related to Chicano students' school achievement. Under the direction of E. G. Begle, the Stanford Mathematics Education Study Group reviewed dissertation studies, journal publications, ERIC documents, and various other publications containing information related to the mathematics achievement of Chicano students. The review of the literature began in April, 1974 and was terminated in February, 1975.

The purpose of this paper is to identify patterns of performance which are unique for Chicano students. These patterns may possibly yield insight into research concerning mathematics achievement of Chicano students. The Chicano student population of these studies was identified and restricted by the following criteria: Spanish surname, of Mexican descent, language (bilingual, Spanish-English; monolingual, Spanish), geographic area (southwestern and western United States). The majority of Chicano students in the studies were from backgrounds of low socioeconomic status (SES). This paper summarizes the general results of the literature reviewed and concludes with an annotated bibliography, which includes population, independent and dependent variables, and outcomes of each study reviewed.

The review of the studies is organized according to three major constructs: I) Tests, II) Instructional Programs, and

III) Socio-Cultural-Economic Conditions. Section I, Tests, contains three subsections: A) Mental Ability Profiles, B) Language and Cultural Factors in Tests, and C) Reliability and Predictability of Mental Ability and Achievement Tests. Section II, Instructional Programs, contains three subsections: A) Bilingual Programs, B) Teacher-Student Interactions, and C) Special Programs. Section III, Socio-Cultural-Economic Conditions, contains no subsections. The studies are cross-referenced under appropriate subsections, thus, results of one study may be included under more than one topic.

Constructs

I. Tests

A. Mental Ability Profiles

The word, ability, refers to performance; the term, mental ability, restricts attention to performance on specific intellectual skills tests. There is no consensus of the different intellectual skills included under the general heading of mental ability. Bloom (1956) identifies five intellectual skills of mental ability: remembering, reasoning, problem-solving, concept formation, and creative thinking; whereas Thurstone (1938) suggests seven intellectual skills of mental ability: verbal, number, spatial, memory, reasoning, word-fluency, and perceptual speed. The conventional practice of using a single I.Q. score as the indicator of mental ability is inadequate.

Bernal (1971) approached the investigation of performance on mental tests by questioning the role of task familiarity.

He found that Chicano students benefitted significantly on mental ability tests from an intervention which permitted them to learn the test-marking strategies. Anglo students did not gain from the intervention.

Swize (1971) showed that Chicano and Anglo second graders exhibited different patterns of performance on six Piagetian conservation tasks. Using standardized mental ability tests, Anderson and Evans (1969), Christiansen and Livermore (1970), Killian (1971), and Spence, Mishra, and Ghozeil (1971), found differences in the patterns of mental abilities between the Chicano students and the Anglo students. The Anglo students scored significantly higher on the tasks involving reading or verbal abilities, while the Anglos scored only slightly higher or on the same level as the Chicano students on the non-verbal tests. Although there exists a difference between Anglo and Chicano mental ability profiles, the studies investigated different sets of mental abilities through different tests. Identification of a specific mental ability profile will require additional study.

B. Language and Cultural Factors in Tests

Chicanos' mental abilities are not adequately measured by mental ability tests for several reasons. One reason is that Chicanos are a bilingual population and no adequate translation of these tests has yet been made to serve as a basis for fair comparison. Cronbach (1970) says: "There have been many attempts to compare mental abilities of nations and racial groups by means of performance tests or translated

tests. .... While group comparisons have no practical importance, they might be of scientific interest if the tests were a fair basis for comparison [p. 246]." Moreno (1973, pp. 415-419) further argues that Chicano students are penalized by tests which are either entirely in English or in Spanish. In addition to the language factor involved in testing Chicanos, the cultural elements and values included in the tests put Chicanos at a further disadvantage. Environment and cultural demands define expectations, rewards, and intellectual behavior. Little is known about the pervasiveness of the cultural factors in determining ability test scores and interaction between ability test performance and achievement.

Massarotti (1971) investigated the effect of giving test instructions in Spanish and found no difference in the students' performance. Davis and Personke (1968, 1969), Keston and Jimenez (1954), Palmer and Gaffney (1972), and Swanson and DeBlassie (1971) administered translated I.Q. tests and achievement tests in Spanish, but found no difference between the English versions and the Spanish versions. However, all of the above five studies contained design problems and the results are not conclusive.

Translations of test instructions and tests did not significantly improve Chicano test performance. Instead, the English version produced higher correlations with achievement (Davis et al., 1968, 1969; Keston et al.,1954; Massarotti, 1971). The strict translation of an English test into Spanish did not take into account two major problems. First, Chicano students

receive formal education in the reading and speaking of English, not Spanish (bilingual-bicultural programs are recent and are discussed in another section). Second, and more serious, none of the translations considered the cultural biases of the tests.

C. Reliability and Predictability of Mental Ability and Achievement Tests

Several studies investigated the reliability of mathematics achievement tests and predictability of mathematics achievement of Chicano students. Thomas (1970) found that several mathematics achievement scales which have high reliability for Anglo students registered very low reliabilities when administered to Chicano students. However, the attitude scales were found to have equivalent reliabilities for the Chicano and the Anglo students. Begle (1972) found that short scales which had good predictability for mathematics achievement of Anglo students did not correlate with mathematics achievement of Chicano students.

Anderson et al. (1969), Cain (1970), and MacMillan (1971) studied the correlation between sociocultural factors with school achievement. MacMillan (1971) found that a combination of sociocultural factors is a better predictor than I.Q. on school achievement of Chicano students. Anderson et al. (1969) and Cain (1970) did not find any significant results. In a similar study, McNamara (1970) failed to locate a good predictor of school achievement.

Goldman and Richards (1972) found that when the regression coefficient of the Anglo students' GPA on the SAT scores was used for Chicano students, it overpredicted. Jenson (1961)

found that the low I.Q. Chicano students performed significantly better than the low I.Q. Anglo students on both the Familiar and the Abstract Tasks for Recall and Serial Learning.

The research above suggests that tests and instruments that are developed for the Anglo population might have serious reliability and predictability problems when administered to Chicano students. When a standardized instrument is administered to the Chicano students, the results must be interpreted with great care. It appears more research is needed in this direction.

II. Instructional Programs

A. Bilingual Programs

Bilingual instructional programs are a possible means of improving mathematics achievement for Chicano students, cognitively as well as affectively. De Weffer (1972), Hillerby (1970), and Trevino (1968) investigated bilingual programs in the first grade. Hillerby (1970) found students having bilingual instruction scored significantly better on the aural posttest measure than students who had instruction only in English, but there were no significant differences on the written computational measures. De Weffer (1972) implemented a bilingual program in first grade, but due to an analysis error, results were not conclusive. Trevino (1968), whose posttest was divided into two parts, Fundamentals and Reasoning, found that a bilingual program significantly improved scores in Fundamentals but not in Reasoning. Solini (1971) and Trevino (1968) investigated the third grade. Both found that bilingual instruction

significantly improved higher level achievement (reasoning and concepts), but not the more basic processes (computation). In the ninth grade, Covey (1973) found no significant differences in mathematics achievement between the monolingual and the bilingual programs.

In addition to cognitive aspects, Covey (1973) investigated the affective domain. Students' attitudes toward self, peers, school, and teacher were improved by participation in a bilingual program.

More research is necessary before any substantive remarks can be made about the effect of bilingual programs on the mathematics achievement of Chicano students.

B. Teacher-Student Interactions

Oliveira (1970), in studying the effect of teacher ethnicity on classroom interaction, found that Chicano teachers asked more divergent questions, and that Chicano students respond more often with a Chicano teacher than with an Anglo teacher. With respect to the general aspects of interaction, Anderson (1969b) showed that Chicano students' performance on arithmetic achievement tests was best in classrooms where teachers spent the least amount of time lecturing.

Anderson (1969b) and Garner (1963) both discovered significant relationships between teacher background and student achievement in Chicano students. Anderson (1969b) further related performance on achievement tests to instructional approach, as Garner (1963) did with teacher attitude toward material being taught. De Weffer (1972) found that Anglo teachers have more empathy with students in the bilingual program than do Chicano teachers.

C. Special Programs

In addition to the bilingual programs, many studies have developed new curriculum materials or have varied classroom procedures in order to study different aspects of the mathematics achievement of Chicano students.

Castaneda (1967) developed a mathematics program based on concepts for first grade Chicano students. Chicano boys, as well as the low ability group, performed significantly better in the experimental program than in the conventional instructional program.

Johnson (1971) and Tickner (1972) developed geometry programs for first and second grade Chicano students. Johnson (1971) found that the program was effective in teaching geometry to both the Chicano and the Anglo students. Tickner (1972) concluded that children from the same grade level, regardless of background, experienced the same degree of difficulty with the geometry material.

Fisher, Blackwell, Garcia, & Greene (1974) studied the achievement of students given control over the choice of the difficulty level of their problems. The experiment was performed with fourth and fifth grade students who were predominantly Chicano, and employed computer assisted instruction. The students able to choose their level of difficulty had higher engagement levels, but lower mean scores, than those given no choice.

Gargiulo (1970) studied the effects of an "open classroom" compared with a regular classroom. He found there was no

difference in arithmetic achievement between the two types of classrooms.

Thomas (1970) studied the effect of a special edition of a SMSG textbook on low achievers. The textbook was prepared for junior high school students and was designed to concentrate on mathematical ideas and relationships and to relieve the students from as much computation as possible. This study showed that the Chicano low achievers scored higher on the posttests and the achievement tests than the non-Chicano low achievers. The non-Chicano low achievers showed an improvement in attitude, but the Chicano students did not.

Hollen (1970) studied information processing strategies among college freshmen who either used English as their primary language or as their acquired language. He concluded that students who use English as an acquired language may have different information processing strategies from students whose primary language is English.

The final two studies of this section deal with school desegregation from grades one through eight. Morrison (1972) found there were no differences in Chicano students' achievement in a segregated or desegregated school environment. Singer (1970) found in a desegregated school environment there were no significant Chicano-Anglo contrasts at grade three, but by grade six, there were significant contrasts. The Anglo students maintained their achievement average while the Chicano means decreased.

III. Socio-Cultural-Economic Conditions

Studies comparing SES with mathematics achievement and performance on standardized tests of Chicano students (Anderson, 1969a, 1969b; Christiansen et al., 1970; Palmer et al., 1972) found that students classified as high and middle SES performed significantly better than students classified as low SES.

Acculturation, measured by the number of generations lived in the United States, was also found to be a factor affecting school achievement and performance on standardized tests (Anderson, 1969a, 1969b; Anderson et al., 1968).

Dickson (1972) and Rivera (1971) studied ethnically different students of low SES background. Rivera (1971) found second and fifth grade Chicano students did not differ from "disadvantaged" students of other ethnicities on total English language ability, as measured by the Stanford Achievement Test. The data analysis of the Dickson study was erroneous, therefore the result was not conclusive.

MacMillan (1971) studied various factors of first grade Chicano students and found that parent's occupation, family size and organization, preschool experience, sex, and school attendance were more significant than I.Q. as a predictor of school achievement.

Results of these studies underscore the need to incorporate socio-cultural-economic information in research on the school performance of Chicano students.

ANNOTATED BIBLIOGRAPHY

Anderson, J. G. Patterns of achievement among Mexican-American students. Interim Report, Mathematics Education Program, Southwest Educational Development Laboratory, Research Center New Mexico State University, Las Cruces, New Mexico, Oct. 1969. (a)

INDEPENDENT VARIABLE: Geographic location of residence--boundaries selected to correspond to acculturation levels.

DEPENDENT VARIABLE: California Test of Mental Maturity, California Achievement Test, Contemporary Mathematics Test, and Parental Interviews

POPULATION: Students from grades 1, 3, 6, 7, 9, 10, 11, & 12 were sampled from three distinct ecological areas in South El Paso, Texas. Intact classrooms were sampled.

OUTCOME: Area differences in favor of increasing acculturation were significant at first grade and remained relatively constant across grades. However, all three areas scored below average. Profiles were similar across areas and grades. Non-language I.Q. was significantly greater than language I.Q., but on the CAT the arithmetic fundamental scores were at least one-half a standard deviation below the reading scores and a full standard deviation below the language scores.

Anderson, J. G. Factors affecting achievement among Mexican-Americans in a metropolitan context. Final Report, Mathematics Education Program, Southwest Educational Development Laboratory, New Mexico State University, Las Cruces, New Mexico, Dec. 1969. (b)

INDEPENDENT VARIABLE: Social composition of students, teachers' instructional approach, and teacher characterisitcs.

DEPENDENT VARIABLE: Student school achievement, California Test of Mental Maturity, California Achievement Test, Contemporary Mathematics Test, Reading and Arithmetic subtests of California Achievement Test, Minnesota Teacher Attitude Inventory, and Flanders Interaction Analysis.

POPULATION: 3204 predominantly Chicano students from three distinct ecological areas in South El Paso, Texas. Three schools from each area were sampled. 72 mathematics teachers from these three areas were included in this study.

OUTCOME: Social class affected the classroom environment as well as the performance on the two Arithmetic Achievement tests. Students from higher SES performed best. Teacher's background, experience, and educational approach affected student performance on achievement tests. In general, students performed best on both achievement tests in those classrooms where the teacher spent the least amount of time talking and lecturing.

Anderson, J. G., & Evans, F. Achievement and the achievement syndromes among Mexican-American youth. In Paul Kutsche's Measuring Socio-Cultural Change, Colorado Associated University Press, 1969.

INDEPENDENT VARIABLE: Ethnicity: Anglo, English speaking Chicano, bilingual (English and Spanish) Chicano.

DEPENDENT VARIABLE: Five measures of achievement: English and mathematics grades, the Language Skills and Arithmetic Skills subtests from the Iowas Test of Basic Skills, and the non-language intelligence test score from the California Test of Mental Maturity.

POPULATION: A stratified random sample of 163 families from 216 families of Las Cruces, New Mexico.

OUTCOME: Analyses suggest that the socialization and cognitive development of Mexican-American students may lag behind that of Anglo students. The lack of independence training that these children experience in the home coupled with their negative self-image and fatalistic outlook may make it difficult for them to identify with new reference groups outside of the family, thus, inhibiting their educational and occupational achievement.

Anderson, J. G., & Johnson, W. Sociocultural determinates of achievement among Mexican American students. Monograph from National Conference on Educational Opportunities for Mexican Americans, April, 1968.

INDEPENDENT VARIABLE: Survey to determine ethnic background, SES, and characterisitics of the student and his family.

DEPENDENT VARIABLE: Student's grades in mathematics and English the previous semester.

POPULATION: 263 New Mexico junior and senior high school students from a town of 50,000; of which 50% were Mexican American.

OUTCOME: English grades were significantly better for non-Mexican Americans and for fourth generation Mexican Americans in comparison with first through third generation Mexican Americans. No significant difference in mathematics grades.

Begle, E. G. Learning correlates for Mexican-American students. Unpublished SMSG Working Paper No. 12, Stanford University, November, 1972.

INDEPENDENT VARIABLE: Battery of pretests: Five Dots, Necessary Arithmetic Operations, Division, Factors and Primes

DEPENDENT VARIABLE: Factors and Primes posttest

POPULATION: Two seventh grade classes in the Fisher School of the Alum Rock District of San Jose, California. The majority of students had Spanish surnames.

OUTCOME: The reliabilities of the pretests were about the same as when the pretests were administered to Anglo students in a previous study. The pretests did not correlate with the posttest for Chicano students in this study; whereas, in the previous study the pretests had significant positive correlations with the posttest for Anglo students.

Bernal, E. M., Jr. Concept learning among Anglo, Black, and Mexican-American children using facilitation strategies and bilingual techniques. (Doctoral dissertation, University of Texas at Austin) Ann Arbor, Mich.: University Microfilms, 1971. No. 72-15707.

INDEPENDENT VARIABLE: Pretraining on parallel test items

DEPENDENT VARIABLE: Spatial Relations subtest of the Primary Mental Abilities, grades 6-9; Letter Sets (French, Ekstrom, and Price, 1963); and Number Series.

POPULATION: 192 eighth grade students from eight public schools and six private schools in San Antonio, Texas. Ethnic groupings consisted of Anglo students, Black students, English-speaking Mexican-American students, and bilingual Mexican-American students.

OUTCOME: Mexican-American and Black students benefited significantly from an intervention which permitted them to learn the test-marking strategies or the nature of the Concept Learning tasks required by the examination through such techniques as practice with feedback.

Cain, M. A. A study of relationships between selected factors and the school achievement of Mexican-American migrant children. (Doctoral dissertation, Michigan State University) Ann Arbor, Mich.: University Microfilms, 1970. No. 71-2043.

INDEPENDENT VARIABLE: Age, sex, Roe-Siegelman Parent-Child Relations Questionnaire, "mode of response" to test concerning problems of Mexican-American children.

DEPENDENT VARIABLE: Wide-Range Achievement Test, Arithmetic and Reading scores.

POPULATION: 58 migrant Mexican-American children ages 7-13 who attended a voluntary school program in Michigan in the summer of 1967.

OUTCOME: Arithmetic scores were higher than Reading scores for all ages. Casual, rejecting, and neglecting mothers had children with significantly lower Reading and Arithmetic scores. Loving fathers had children with significantly better Arithmetic scores. Casual fathers had children with significantly lower Reading scores.

Castaneda, A. M. The differential effectiveness of two first grade mathematics programs for disadvantaged Mexican-American children. (Doctoral dissertation, University of Texas at Austin) Ann Arbor, Mich.: University Microfilms, 1967. No. 68-4264.

INDEPENDENT VARIABLE: Arithmetic Readiness, measured by Number Subtest on the Metropolitan Readiness Test; Total Readiness, measured by Total Scores on the Metropolitan Readiness Test; Sex; Membership in Group 1 or Group 2: Group 1 had a special teacher and a math program written for this study, Group 2 had their regular teacher and the regular math textbook.

DEPENDENT VARIABLE: Arithmetic Achievement Gain (AAG) was measured by the difference in standard scores of the Arithmetic Subtest of the Metropolitan Achievement Test and the Arithmetic Readiness scores.

POPULATION: 33 first grade students from Spanish-speaking homes, who had entered first grade at the first legal opportunity, and who had no previous school experience of any kind.

OUTCOME: Mean AAG made by Group 1 was significantly different from mean AAG made by Group 2. Mean AAG made by boys in Group 1 was significantly different from mean AAG made by boys in Group 2. Mean AAG made by lower third on Number Readiness score in Group 1 was significantly different than mean AAG made by lower third of Group 2. Mean AAG was significantly different between lower third and upper third of Group 2 based on Number Readiness.

Christiansen, T., and Livermore, G. A comparison of Anglo-American and Spanish-American children on the WISC. The Journal of Social Psychology, 1970, 81, 9-15.

INDEPENDENT VARIABLE: Ethnic origin and social class

DEPENDENT VARIABLE: WISC: Full scale I.Q., Verbal scale I.Q., Performance scale I.Q., Intellective factors of Verbal Comprehension, Freedom from Distractibility, Perceptual Organization, Relevance

POPULATION: 92 Anglo and Spanish-American children 13 to 14 years of age.

OUTCOME: General intelligence and the development of verbal abilities, including the ability to use acquired verbal skills in new situations, are related to ethnic origin and social class. Nonverbal abilities, perceptual organization ability, and the ability to concentrate on a task were found to relate only to subject's membership in a particular social class.

Covey, D. D. An analytical study of secondary freshman bilingual education and its effects on academic achievement and attitudes of Mexican-American students. Unpublished doctoral dissertation, Arizona State University, 1973.

INDEPENDENT VARIABLE: Bilingual program, regular school program

DEPENDENT VARIABLE: Mathematics, English, and reading achievement measured by The Iowa Test of Educational Development and Stanford Diagnostic Reading Test, Level II. Attitudes toward self, peers, school, and teachers measured by The Nebraska Attitude Inventory.

POPULATION: 200 ninth grade Chicano students in Phoenix Union High School, Phoenix, Arizona.

OUTCOME: Statistically significant differences were found in the areas of reading, English, attitudes toward self, peers, school, and teachers. No significant differences were found in mathematics achievement.

Davis, O. L., Jr., & Personke, C. R., Jr. Effects of administering the Metropolitan Readiness Test in English and Spanish to Spanish-speaking school entrants. Journal of Educational Measurement, Fall, 1968.

INDEPENDENT VARIABLE: Administration of test in English and in Spanish

DEPENDENT VARIABLE: Metropolitan Readiness Test, Form A.

POPULATION: 88 Spanish-speaking children in their first school year from two elementary schools in South Texas. Fifty-three of these children were enrolled in a pre-first grade section (readiness class) and thirty-five were enrolled in the regular first grade section.

OUTCOME: Analysis of the Word Meaning subtest scores revealed that the children performed at a significantly higher level when the test was administered in Spanish. On the Alphabet and Numbers subtests, significant differences favored the test administration in English.

Davis, O. L., Jr., & Personke, C. R., Jr. Predictive validity of English and Spanish versions of a readiness test. The Elementary School Journal, November, 1969.

INDEPENDENT VARIABLE: Administration of test in English and in Spanish

DEPENDENT VARIABLE: Predictive validity of the Metropolitan Readiness Tests as measured by the Metropolitan Achievement Tests, Primary I Battery, Form B.

POPULATION: 38 Spanish-speaking children enrolled in regular first-grade sections in a South Texas school where about 90% of the children had Spanish surnames.

OUTCOME: The subtests of Word Meaning and Listening of the Metropolitan Readiness Test were not highly related to reading success. All other relationships, for both administrations, were positive and statistically significant. Three differences favoring the English administration were obtained when scores on the Alphabet subtest were correlated with the scores on the Metropolitan Achievement Tests. Three differences favoring the Spanish administration of the Metropolitan Readiness Test were obtained when scores on the Copying subtests were correlated with scores on the Metropolitan Achievement Test.

de Weffer, R. del C. E. Effects of first language instruction in academic and psychological development of bilingual children. Unpublished doctoral dissertation, Illinois Institute of Technology, 1972.

INDEPENDENT VARIABLE: Bilingual program, monolingual program

DEPENDENT VARIABLE: Test of Basic Experience, administered in English and Spanish. Kratchvill, Carkhuff, & Berenson Empathy Scale given to teachers and aides in bilingual program. Observation checklists on classroom behavior of teachers and aides.

POPULATION: 156 first grade students of Spanish-speaking background, from eleven Illinois city school districts which had bilingual programs.

OUTCOME: Mathematics achievement and language achievement showed significant gains when measured in Spanish for students in the bilingual program. No differences between bilingual program and monolingual program students were found in language and mathematics achievement when measured in English. Empathy measures showed teachers having greater empathy than aides. Anglo teachers showed greater empathy than Latin teachers. The data analysis was erroneous since the ANCOVA used the student as the unit for analysis rather than the class.

Dickson, J. M. T. A comparison of mathematical achievement of selected objectives by ethnically unequal students of a low SES background. Unpublished masters thesis, University of Texas at Austin, May 1972.

INDEPENDENT VARIABLE: Ethnicity: Black, Chicano, Anglo

DEPENDENT VARIABLE: Mathematics achievement

POPULATION: Fourth grade students. Chicano population was selected from two schools in El Paso, Texas. Black students from two schools in Baton Rouge, Louisiana. Two classes from a school with a predominantly Anglo population were selected.

OUTCOME: The data analysis was erroneous, and the result was not conclusive.

Fisher, M. D., Blackwell, L. R., Garcia, A. G.,& Greene, J. C. "Student control and choice: their effects on student engagement in a CAI arithmetic task in a low-income school. Stanford Center for Research and Development in Teaching, Technical Report No. 41, August 1974.

INDEPEDENT VARIABLE: Ethnicity, age, sex, initial math achievement as measured by the Metropolitan Achievement Test and the Stanford Achievement Test

DEPENDENT VARIABLE: The effect of two treatment groups, choice and control, were compared on the bases of daily scores on the CAI Drill and Practice program and engagement levels recorded every 10 seconds.

POPULATION: Two groups of 19 subjects were selected from fourth and fifth grade students with no previous CAI experience. Students came from three ethnic backgrounds: 27 Mexican-American, 9 Black, 2 Anglo.

OUTCOME: Using a t-test, significant differences were found for both the percent of correct responses and the number of problems worked. Means for the choice group were lower than those of the control group. Two patterns of student choices were identified: one set of students consistently chose easier or same difficulty level problems while maintaining a high percentage of correct responses (mean of 91%), the other set of students requested the same or harder level problems and scored much lower (mean of 53%).

Gargiulo, R. A field study to effect changes in academic achievement levels of under achieving seventh grade students. (Doctoral dissertation, University of New Mexico) Ann Arbor, Mich.: University Microfilms, 1970. No. 71-12777.

INDEPENDENT VARIABLE: Normal classroom procedure, open classroom procedure in language arts class. Roughly one-third of the students also had an open classroom in mathematics.

DEPENDENT VARIABLE: Achievement tests in reading, social studies, arithmetic reasoning, and arithmetic concepts.

POPULATION: 235 seventh grade students from Albuquerque, New Mexico. 54% were Mexican American, and all had been classified as under achievers.

OUTCOME: The open classroom produced 2.66 times the expected gain in reading achievement scores. No significant differences in arithmetic.

Garner, M. V. A study of the educational backgrounds and attitudes of teachers toward algebra as related to the attitudes and achievement of their Anglo-American and Latin-American pupils in first-year algebra classes of Texas. Unpublished doctoral dissertation, North Texas State University, 1963.

INDEPENDENT VARIABLE: Teachers: professional background, mathematical background, attitude toward algebra, feelings about algebra's practical value. Pupils: ethnic background.

DEPENDENT VARIABLE: Pupils: attitude toward algebra, feelings about algebra's practical value, achievement.

POPULATION: 45 teachers, 290 Latin-American ninth grade pupils, 873 Anglo-American ninth grade pupils from selected public junior and senior high schools in West Texas.

OUTCOME: Significant relationships existed between: 1) teachers' attitudes and student achievement; 2) teachers' math background and student achievement (for Anglos); 3) teachers' professional background and student achievement--in an inverse way; 4) teachers' estimate of practical value and student achievement (for Anglos); 5) teachers' attitudes and students' attitudes; and 6) teachers' attitudes and changes in students' attitudes (for Latins).

Goldman, R. D., & Richards, R. The SAT prediction of grades for Mexican-American versus Anglo-American students at the University of California at Riverside. ERIC ED 088 904.

INDEPENDENT VARIABLE: The SAT scores, both verbal and math

DEPENDENT VARIABLE: Second quarter grade point average.

POPULATION: A random sample of 42 Mexican-Americans and 210 Anglo-Americans from the freshman list of UC Riverside in the Fall of 1971.

OUTCOME: The hypothesis that the two groups had the same regression (GPA on SAT) plane was rejected ($F = 3.95$). When the regression coefficient for the Anglo group was used on the Mexican-American group, it over-predicted. Mathematics scores on the SAT had no correlation with the GPA, while the beta weight of GPA on SAT verbal was .40 for the Mexican-Americans.

Guynn, K. P. Effects of ethnicity and socioeconomic status on learning achievement of ninth- and eleventh-grade students. April 1974. ERIC ED 088 655.

INDEPENDENT VARIABLE: Ethnicity: Mexican American and Anglo American. Socioeconomic status: High and Low SES, as measured by the Hollingshead Two Factor Index of Social-Position.

DEPENDENT VARIABLE: Iowa Test of Educational Development

POPULATION: 157 subjects from the ninth and eleventh grades of Hot Springs High School, Truth or Consequences School District, New Mexico.

OUTCOME: A two-way analysis of variance was performed on the ninth graders and another one on the eleventh graders. The only significant factor was Ethnicity of the eleventh graders.

Hillerby, R. W. Teaching first grade math to Spanish speaking students. (Doctoral dissertation, University of California, Los Angeles) Ann Arbor, Mich.: University Microfilms, 1970. No. 71-636.

INDEPENDENT VARIABLE: Ten programmed units: (a) taught first in Spanish and then repeated in English, or (b) taught both times in English.

DEPENDENT VARIABLE: Diagnostic tests that accompany *Modern School Mathematics: Structure and Use, Book One*.

POPULATION: 40 first grade students in Los Angeles with low scores on an English proficiency test. Spanish was the language spoken in the home of all the subjects.

OUTCOME: Group with instruction in both Spanish and English scored significantly better on the aural portion of the posttest.

Hollen, T. T., Jr. Interaction of individual abilities with the presence and position of adjunct questions in learning from prose materials. (Doctoral dissertation, University of Texas at Austin) Ann Arbor, Mich.: University Microfilms, 1970. No. 71-11554.

INDEPENDENT VARIABLE: The relative position of the adjunct questions and the passage: preceding each passage, following each passage, or no question. Associative memory measured by the First and Last Names Test. Verbal Comprehension derived from the Advanced Vocabulary Test. Memory Span measured by the Auditory Letter Span Test. Matrix Test. English as a primary language or Bilingual (English as an acquired language).

DEPENDENT VARIABLE: Materials consisted of six, 93-108 word, passages. Students were given 60 seconds for each passage. There were two types of adjunct questions: relevant and incidental.

POPULATION: 136 students from the freshman introductory psychology class.

OUTCOME: Since the statistics were primarily descriptive, the outcomes must be stated in terms of comparisons and not statistical significances. Bilingual students may have adopted information processing strategies that differed from those adopted by students for whom English was a primary language. Differences were found in the dependent data between monolinguals and bilinguals. The treatments produced differences in the incidental scores for the monolinguals; while for the bilinguals the treatments produced differences in the relevant question scores.

Jenson, A. R. Learning abilities in Mexican-American and Anglo-American children. California Journal of Educational Research, Sept. 1961.

INDEPENDENT VARIABLE: Ethnic group, and I.Q. as measured by the California Test of Mental Maturity

DEPENDENT VARIABLE: Learning scores of fourth graders on both the Familiar and Abstract tasks for Recall and Serial Learning, and Learning Scores of sixth graders on the Familiar tasks for Recall, Serial Learning, and Paired Associates tests.

POPULATION: Native-born Americans living in California from the lower SES. The Mexican-American group was bilingual, and the Anglo group was monolingual. I.Q. range was from 60 to above 120.

OUTCOME: A significant "Nationality" X I.Q. interaction was found with the fourth graders. The low I.Q. Mexican-Americans and the low I.Q. Anglos were widely separated in learning scores, and the bright groups were more similar. The Recall tests showed a significant over-all difference between I.Q. levels. For the sixth graders, the Serial Learning tests showed significant differences between I.Q. levels and showed a significant "Nationality" X I.Q. interaction, with the low I.Q. Mexican-Americans performing much better than the low I.Q. Anglos.

Johnson, L. H. Elementary school geometry: a study of achievement on selected objectives of geometry of Mexican American and Anglo American second grade children. (Doctoral dissertation, University of Northern Colorado) Ann Arbor, Mich.: University Microfilms, 1971. No. 72-3273.

INDEPENDENT VARIABLE: Spanish or non-Spanish surname, teacher, MAT reading score, MAT arithmetic score, and pretest.

DEPENDENT VARIABLE: Posttest written by author covering material taught. (posttest same as pretest)

POPULATION: 99 Colorado second grade students in four classes, two of which were predominantly Mexican American.

OUTCOME: t-test showed significant differences between pre- and posttest scores for both Mexican Americans and Anglo Americans. The MAT arithmetic score was an effective predictor of the posttest score.

Keston, M. J., & Jimenez, C. A study of the performance on English and Spanish editions of the Stanford-Binet Intelligence Test by Spanish American children. The Journal of Genetic Psychology, 1954, 85, 263-269.

INDEPENDENT VARIABLE: Stanford-Binet in English and Spanish

DEPENDENT VARIABLE: Performance of Chicano children on Stanford-Binet, Form M in English and Form L in Spanish.

POPULATION: 50 fourth grade Chicano children from Albuquerque, New Mexico. Ages ranged from 9 yrs. 3 months to 11 yrs. 9 months. Average age was 9.85 years.

OUTCOME: Scores showed a range of 62-92 for the Spanish version and a range of 58-121 for the English version, with means of 71.8 and 86.0, and standard deviations of 9.9 and 15.3, respectively. A correlation of .36 was found between I.Q. scores of the two linguistic versions. A t-test showed significantly better performance on the English version.

Killian, L. R. WISC, Illinois Test of Psycholinguistic Abilities, and Bender Visual-Motor Gestalt test performance of Spanish-American kindergarten and first-grade children. Journal of Consulting and Clinical Psychology, 1971, 37(1), 38-43.

INDEPENDENT VARIABLE: Language ability and ethnic group, sex, grade level.

DEPENDENT VARIABLE: Bender Visual-Motor Gestalt Test; WISC subtests: Picture Arrangement, Block Design, Object Assembly, Coding, Information, Comprehension, Arithmetic, Similarities, and Vocabulary; Illinois Test of Psycholinguistic Abilities.

POPULATION: 84 subjects selected on the basis of language ability and ethnic group (Anglo monolinguals, Spanish-American monolinguals in English, and Spanish-American bilinguals), sex, and grade level.

OUTCOME: The three language groups scored significantly different at the .001 level on the WISC Verbal I.Q. Boys scored significantly higher than girls on the WISC Verbal I.Q. Language group was significantly different on WISC Performance I.Q. and on WISC Full Scale I.Q. Language group and grade main effects were significant on the Illinois Test of Psycholinguistic Abilities. On the Bender there were no group differences although the Group X Grade interaction and the grade main effect were significant. There were no differences on arithmetic which requires a nonlanguage symbolic system.

MacMillan, R. W. A study of the effect of SES factors on the school achievement of Spanish-speaking school beginners. Unpublished doctoral dissertation, University of Texas at Austin, 1971. ERIC ED 049 864.

INDEPENDENT VARIABLE: Parent's occupation-family size-number of extended family members; child's school attendance; preschool experience; I.Q.

DEPENDENT VARIABLE: School achievement

POPULATION: 305 Mexican American students.

OUTCOME: The combination of parent's occupation, family size and organization, preschool experience, sex, and school attendance was more significant than I.Q. as a predictor of school achievement.

Massarotti, M. C. Effect of the Spanish language as auditory stimulation during test administration on the measured achievement of fifth grade Spanish-surnamed pupils. (Doctoral dissertation, University of Denver) Ann Arbor, Mich.: University Microfilms, 1971. No. 72-2134.

INDEPENDENT VARIABLE: Administration of test in English, Spanish, and bilingually.

DEPENDENT VARIABLE: Word Meaning and Arithmetic Reasoning subtests of the Short Test of Educational Ability, Level Three.

POPULATION: 142 fifth grade students from two schools. All were Spanish-surnamed pupils. 63 Ss came from School 1, and 79 Ss came from School 2.

OUTCOME: No statistically significant differences existed among treatment groups on achievement as measured by STEA Arithmetic Reasoning subtest while blocking, in separate analysis, on School, Sex, and understanding of Spanish. There is no evidence to suggest that variation of test stimulation did affect achievement in arithmetic.

McNamara, P. H. Some factors associated with differential grade performance of Mexican American and non-Mexican American college students. Unpublished doctoral dissertation, University of Texas at El Paso, March 1970. ERIC ED 042 541.

INDEPENDENT VARIABLE: Ethnicity: Mexican American or Anglo.

DEPENDENT VARIABLE: Sex, number of siblings at home, parent income, parent educational attainment, amount of Spanish spoken at home, and Grade Point Average.

POPULATION: 782 students who filled out the questionnaire given at the beginning of the spring semester of 1969, in an introductory sociology course.

OUTCOME: Numerous tables were presented, and the experimenter concluded that none of the factors were good predictors for GPA.

Montgomery, R. L. A study of relationships between Group Test of Creativity (GTOC) scores and Achievement Test scores of students with Spanish and non-Spanish surnames. Unpublished doctoral dissertation, University of Southern California, 1973.

INDEPENDENT VARIABLE: Sex, Surname, Place of birth (California, other United States, foreign countries), SES

DEPENDENT VARIABLE: Creativity measured by GTOC, I.Q. measured by Lorge-Thorndike Intelligence Test, and achievement measured by Comprehensive Test of Basic Skills.

POPULATION: Entire sixth grade of Mountain View School District in El Monte, California. 203 students for the Creativity and I.Q. setting. 103 students for the Achievement setting.

OUTCOME: Students with non-Spanish surnames acored significantly higher than those with Spanish surnames on: Verbal I.Q., Reading Achievement, Arithmetic Achievement, and Sensitivity to Problems. Girls scored significantly higher than boys on Redefinition, Sensitivity to Problems, Reading Achievement, and Language Achievement. For the socioeconomically advantaged students, the Sensitivity to Problems subtest of the GTOC was in significant agreement with Arithmetic Achievement and not Language Achievement, while among the disadvantaged, the reverse was true.

Morrison, G. A., Jr. An analysis of academic achievement trends for Anglo-American, Mexican-American, and Negro-American students in a desegrated school environment. Unpublished doctoral dissertation, University of Houston, 1972.

INDEPENDENT VARIABLE: Sex, Race, Segregation/desegregation

DEPENDENT VARIABLE: Iowa Test of Basic Skills

POPULATION: 1560 elementary and junior high school students from each of the three ethnic groups and from each of the segregated, segregated/desegregated, and desegregated school settings in a large urban district.

OUTCOME: None of the results for Mexican-American students were statistically significant.

Oliveira, A. L. A comparison of the verbal teaching behaviors of junior high school Mexican American and Anglo American teachers of social studies and mathematics classes of predominantly Spanish-speaking children. Unpublished doctoral dissertation, University of Texas at Austin, 1970.

INDEPENDENT VARIABLE: Ethnic background of teachers

DEPENDENT VARIABLE: Classroom observations scored according to the Observation Schedule and Record 5V (OSCAR 5V, Medley et al., 1968).

POPULATION: 40 eighth grade teachers; 10 teachers in each of the four groups: Mexican American (MA) teachers of math, MA teachers of social studies, Anglo American (AA) teachers of math, and AA teachers of social studies. Median experience was 4.5 years and average age was early thirties. The students were predominantly Mexican American from lower SES.

OUTCOME: Only three teachers used Spanish in the classroom. In the ethnic contrasts: pupils' response statements occurred more often in MA than AA classes; MA teachers asked more divergent questions than AA teachers; and AA teachers used more informing statements than MA teachers. In the subject matter contrasts: math teachers asked more convergent questions, asked more elaborating questions, and had a higher indirect/direct ratio.

Palmer, M., & Gaffney, P. Effects of administration of the WISC in Spanish and English and relationship of social class to performance. Psychology in the Schools, 1972, 9, 61-64.

INDEPENDENT VARIABLE: Language: Spanish, English

DEPENDENT VARIABLE: WISC

POPULATION: The entire fifth grade population of the Nogales Elementary School District was used, and of these, a random sample of one-half was chosen. The 150 children involved were given the WISC in English. After a year, a random sample of 30 from the 150 was given the Spanish translation of the WISC.

OUTCOME: ANOVA revealed no significant differences between the English and Spanish testings on any of the subtest scaled scores.

Rivera, H. H. Ascertaining language and computational curriculum needs for economically disadvantaged Mexican-Americans. (Doctoral dissertation, Arizona State University) Ann Arbor, Mich.: University Microfilms, 1971. No. 71-29404.

INDEPENDENT VARIABLE: Ethnic group, SES, Family language

DEPENDENT VARIABLE: Primary battery and intermediate battery of the Stanford Achievement Test

POPULATION: 112 second graders and 119 fifth graders who were classified as "disadvantaged". The students were then divided into two groups: a) Mexican-American and b) other (Anglo, Indian, Black).

OUTCOME: In grades 2 and 5, disadvantaged Mexican-American children did not differ significantly from other disadvantaged children of the same or other cultural backgrounds on total English language ability. The disadvantaged Mexican-American children in grade 5 were .68 academic months below the grade norm in total achievement for the five classes measured in this study.

Singer, H. Effect of integration on achievement of Anglos, Blacks, and Mexican-Americans. California State Office of Compensatory Education, 1970. ERIC ED 041 975.

INDEPENDENT VARIABLE: Ethnicity, Segregated or integrated school, Years integrated, 1965, 1966, 1967.

DEPENDENT VARIABLE: Dependent measures were taken during the three years when three de-facto segregated schools were being combined into one integrated school. Stanford Reading Test, SCAT, STEP, District achievement tests in reading and math.

POPULATION: Elementary school children from Riverside Unified school district. Groups examined were Anglos and Blacks integrated in 1965 and 1966, and Chicanos integrated in 1966 and 1967.

OUTCOME: No significant differences were found across time within any ethnic group. Integration did not produce a convergence in achievement between majority and minority pupils. Instead, Chicano-Anglo contrasts which were not significant at grade 3, were significant by grade 6: Anglos maintained achievement average, and Chicanos' means decreased.

Solini, J. The effects of bilingual instruction on the achievement of elementary pupils. Unpublished doctoral dissertation, East Texas State University, May 1971.

INDEPENDENT VARIABLE: Bilingual or monolingual instruction in the classroom.

DEPENDENT VARIABLE: Achievement in vocabulary, reading, spelling, language, arithmetic computation, and arithmetic reasoning. Otis Quick Scoring Mental Ability Test, Metropolitan Achievement Test, Battery A and its alternate form.

POPULATION: 60 third grade Chicano children from the Harlandale Independent School District in San Antonio, Texas. Experimental group had 19 girls and 11 boys; the control group had 16 girls and 14 boys.

OUTCOME: No significant differences were observed in spelling and arithmetic computation. Significant differences were found in vocabulary, reading, language, and arithmetic concepts.

Spence, A. G., Mishra, S. P., & Ghozeil, S. Home language and performance on standardized tests. Elementary School Journal, March 1971, 309-313.

INDEPENDENT VARIABLE: Language spoken in the home: Spanish only, Spanish and English

DEPENDENT VARIABLE: Student's potential for future scholastic achievement measured by Metropolitan Readiness Test. General ability in dealing with English language concepts measured by Van Alstyne Picture Vocabulary Test. Verbal ability measured by English vocabulary subtest from Stanford-Binet Intelligence Scale and by English vocabulary subtest from WISC.

POPULATION: 146 six-year-old children from twelve elementary schools in Tucson, Arizona. They were of Mexican-American heritage from the lower SES.

OUTCOME: Students who spoke Spanish and English in the home scored significantly better on the Van Alstyne Picture Vocabulary Test and the Stanford-Binet Intelligence Scale, Vocabulary Subtest. The Spanish and English group scored significantly better on the WISC, Vocabulary Subtest.

Swanson, E., & DeBlassie, R. Interpreter effects on the WISC performance of first grade Mexican-American children. Measurement and Evaluation in Guidance, 1971, 4(3).

INDEPENDENT VARIABLE: Administration of test in Spanish

DEPENDENT VARIABLE: WISC

POPULATION: 41 first grade children between the ages of 6 yrs 8 mos. and 7 yrs 11 mos. Both parents were Mexican-American, all entered first grade initially in September, 1969, and all attended Headstart Program in summer of 1969.

OUTCOME: None of the mean differences were statistically significant.

Swize, M. T. Prediction of Piagetian conservation for second grade Mexican-American and Anglo-American children. Unpublished doctoral dissertation, University of Northern Colorado, 1971.

INDEPENDENT VARIABLE: SES, Ethnic background, Primary language used in home, Nursery school, New nursery school, Head Start, Kindergarten, Chronological age, Mental age, I.Q., Sex, Arithmetic, spelling and reading achievement.

DEPENDENT VARIABLE: Six Piagetian conservation tasks measured by the Concept Assessment Kit: two-dimensional space, number, substance, continuous quantity, weight, discontinuous quantity, composite score.

POPULATION: 70 second graders chosen from 3 schools in Greeley, Colorado.

OUTCOME: Chicanos and Anglos showed different patterns of conservation abilities. New nursery school and Head Start had significant correlations with the conservation tasks.

Thomas, S. Low achiever study. Unpublished SMSG Working Paper No. 5, Stanford University, 1970.

INDEPENDENT VARIABLE: Low achievers

DEPENDENT VARIABLE: Newly developed curriculum material, achievement scales and attitude scales.

POPULATION: 16 seventh grade classes with 14 different teachers in 11 schools. The classes were selected by local school officials, and students were two years below grade level in mathematics. The classes were from San Francisco, Oakland, and San Jose, California.

OUTCOME: The pretest scales were unreliable, but the posttest scales were reliable (though the alphas were comparatively low). The attitude scales were all found to be reliable for the low achievers. The non-Chicano students showed an improvement in attitude, but the Chicano students did not.

Tickner, J. G. An exploratory study into the attainment of selected concepts of non-metric geometry by Anglo and Mexican-American first and second grade children. Unpublished masters thesis, University of Texas at Austin, August 1972.

INDEPENDENT VARIABLE: Bilingual Chicano, monolingual Anglo

DEPENDENT VARIABLE: Levels and patterns of attainment of selected non-metric concepts of geometry. The Goodenough-Harris Draw-A-Man Test.

POPULATION: Anglo middle class, 45 first graders and 53 second graders. Chicano lower class, 36 first graders and 41 second graders.

OUTCOME: No significant differences were found. Regardless of the background, children from the same grade level experienced the same degree of difficulty.

Trevino, B. An analysis of the effectiveness of a bilingual program in the teaching of mathematics in the primary grades. Unpublished doctoral dissertation, University of Texas at Austin, 1968.

INDEPENDENT VARIABLE: Students in 1964 monolingual program compared with students in 1965 bilingual program.

DEPENDENT VARIABLE: California Arithmetic Test: Fundamentals and Reasoning.

POPULATION: 34 first and third grade students at Nye Elementary School near Laredo, Texas in 1964 monolingual program; and 62 first and third grade students in the 1965 bilingual program.

OUTCOME: Significant differences favoring the bilingual program were found: First grade students, both English speaking and Spanish speaking, on the Fundamentals subtest; and Third grade students, both English speaking and Spanish speaking, on the Reasoning subtest.

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